

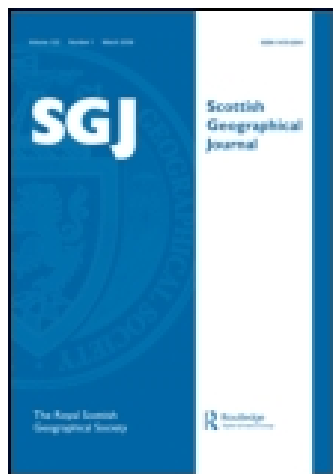
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### Civilisation and climate: A review

James Cossar M.A.

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the Afghan Boundary Commission as special correspondent of the *Pioneer*, and upon this the Adjutant-General who had snubbed my ambitions after Persian scholarship smiled benignly. I went to Herat and almost to Penjdeh, and thus spent the most interesting year of my life. M'Gregor (*Khorasan*, vol. i. p. 39) fully realised what a worthless school India is for the study of Persian, and wrote what many Englishmen, knowing both countries, have said. The Indian pronunciation of Persian is on a par with that of the French of Stratford-at-Bowe. I at least profited by the teaching and society of a real Ispahani. The proficiency in Persian of most Anglo-Indian officers and civilians who have passed examinations under the Calcutta Board is farcical. M'Gregor advised the Government of India to send students of Persian to Shiraz, not Calcutta. He advised in vain. Sir Charles M'Gregor was of a warm temper and could be very plain-spoken. But that kind reminiscence of Sergeant Eadon shows the spirit that was in him. I have always understood that his *Life and Opinions*, published by Messrs. Blackwood in the autumn of 1888, were held by the authorities at Simla and elsewhere to have been a trifle indiscreet. Be that as it may, his diaries (vol. ii. pp. 249-55) make it clear that Phayre was expected to be up in time to co-operate with Roberts (as in my first "Travel Memories" I contended that he should have been) in the attack upon Ayub Khan. M'Gregor admits that the desire to forestall Phayre existed, but deprecates it. It was M'Gregor's Third Brigade that passed us early in September 1880 (we were moving on Kandahar), hastening southward to punish the turbulent tribes to the east and south-east of the Hurnai railway route.

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### CIVILISATION AND CLIMATE: A REVIEW.<sup>1</sup>

By JAMES COSSAR, M.A.

DR. ELLSWORTH HUNTINGTON'S latest work is in many respects a most noteworthy and valuable contribution to geographical science, owing its significance, perhaps, rather more to what it attempts than to its actual achievement, although that is by no means slight. The author's task is nothing less than an attempt to define and to measure as accurately as possible the dependence upon climate of certain vital phenomena, especially those which contribute most to human character. Readers of *The Pulse of Asia* and *The Transformation of Palestine* are already familiar with some of the author's activities and ideas in recent years, and many of the conclusions of these volumes are repeated in his latest work, supported by a considerable body of evidence which has become available since these works were first published. The most valuable part of the present volume, however, deals with the influence of climate

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<sup>1</sup> *Civilisation and Climate*. By Ellsworth Huntington. London: Humphrey Milford, Oxford University Press, 1915. 10s. 6d. net.

on the civilisation of the present day. Some of its conclusions are distinctly original and of far-reaching importance, and the author might perhaps have won a readier acceptance of them if he had refrained for the time being from the attempt, ultimately necessary and desirable, no doubt, to link up his investigations of modern conditions with his theories relating to the civilisations of antiquity. The present volume is avowedly an interim report, issued in order to stimulate discussion and to promote further investigation, for, as the author frankly admits, some of his hypotheses demand much closer examination than they have yet received. Moreover, criticism of some of the conclusions must be withheld until he makes public the evidence on which they have been based.

Huntington's main thesis is that a stimulating climate is an essential condition of civilisation. He cannot be charged with the one-sided view that climate is the only, or the all-important factor, for he makes it perfectly clear at the outset that there are many other potent influences to be taken into account in analysing the complex of civilisation, but it is not his present business to assign to each its relative weight. His aim is to obtain for climate a proper recognition of its peculiar place and function in the evolution of any community and its status in civilisation. He has set out to investigate, in so far as the available data allow, the exact effects of climate upon human activity, and in particular to consider to what extent the climatic conditions tend to help or hinder the development of strong character, of which, after all, the various institutions and elements in the life of a community, its government, its religion, its economic and social structure, are but the outward expression. The practical interest of such a problem is obvious, especially to us from the colonial and imperial point of view, and in this connection Huntington's reasoned views upon the place and prospects of the white man in the tropics may be commended to all serious students of empire.

It is a commonplace to remark that every individual (although all might not willingly admit the statement) is affected by the weather conditions from day to day, certain conditions being bracing and others depressing, some inducing activity, while others tend to discourage, if not actually to prevent it. But few people have set themselves to analyse their own personal experience of the effect of the atmospheric conditions, and in any case their observations are so entirely subjective as to have little value as a basis for any general conclusion. Some more stable and impersonal criterion is necessary as a standard of measurement. In the ordinary task of every day, the most important thing in life for most people, to which they devote the greater part of their time and energy, Huntington finds the necessary standard; the degree of efficiency which man attains in the performance of his daily work reflects the effect of climate, and forms the best available test of its influence. That climate may be taken as the most nearly ideal which best enables man to reach the highest level of efficiency.

The author first seeks to establish that a definite relation does exist between human activity, both mental and physical, and the seasonal climatic conditions. In order to obtain a reliable statistical measure of the effect of climate, he has made a careful analysis of the daily efficiency

throughout a considerable period of several large groups of factory operatives, as tested by their average daily earnings on a piece-work basis. The records of wages applied to different types of factories, free from artificial restrictions of output, which indeed was fully encouraged by the use of methods of remuneration designed for that purpose; the workers employed were of different sexes, ages, and races, performing a wide variety of operations which required different degrees of skill and aptitude. Thus steps were taken to secure that, as far as possible, the earnings of the workers could be regarded as a fairly reliable index of their efficiency. From the material thus obtained Huntington has compiled an interesting series of curves to show the fluctuation in earnings throughout each of the years 1910-1913; he also supplies the curve of the average temperature for this four-year period, but he omits to give the temperature conditions for each of the years, and this seems really essential for purposes of comparison.

The diagrams bring out several very striking results. It appears that the efficiency of the operatives reaches its minimum point in mid-winter, while a second, but less important and more variable, minimum occurs in mid-summer; earnings attain their maximum at the end of October, but a high point is also recorded for June, and again in December, immediately before Christmas. This fluctuation seems to have no connection with questions of trade conditions or factory management, and the only feasible explanation appears to be that it is closely related to the varying climatic conditions. A similar relation is established for mental energy by a study of the marks obtained in the periodic examinations of between 1700 and 1800 students at the Naval and Military Academies at West Point and Annapolis. This general relation between seasonal climate and human activity is also suggested by the seasonal variation in the death rates of New York and of Japan, by the studies of the strength of school children in Copenhagen carried out by Lehmann and Pedersen, by the seasonal variation in the gain in weight by patients in a Consumptive Sanatorium, as well as by the efficiency of workers in other factories in different climatic zones of the United States.

Huntington next proceeds to analyse in turn the effect of the different elements of climate and the special features of the seasonal changes which appear to be of the greatest importance for man's activity. The amount of light, the humidity of the atmosphere, and its freshness, all have a very considerable influence, both physiological and psychological, upon man's work. A point of practical importance upon which Huntington lays stress is the debilitating effect of the extremely arid atmosphere engendered by the method of heating houses in winter, and by the exclusion of the fresh moist air; his remarks may be profitably studied by people who have not yet discovered the proper use of gas fires for heating purposes. But of all the climatic elements temperature is the most important in its effects upon human energy, and indeed upon life in all its forms, as is shown by the researches of Brunnow, MacDougal, Thomson, and others, into the relation between the temperature conditions and the vital processes of plants, animals, and man. It is a matter for regret that the author does not give detailed references to

the authorities and sources from which he has drawn some of his material ; to do so would certainly facilitate the discussion of his own conclusions and promote further investigation.

Two factors in temperature are proved to be of the utmost significance—the actual amount of heat, and its variations from day to day. Huntington's studies of the work of the factory operatives and the students lead him to the conclusion that the optimum temperature for physical energy is in the neighbourhood of  $60^{\circ}$  F., while that for mental activity is a mean temperature of about  $40^{\circ}$  F. "Inasmuch as human progress depends upon a co-ordination of mental and physical activity, we seem to be justified in the conclusion that the greatest total efficiency occurs half-way between the mental and physical optima, that is, with a mean temperature of about  $50^{\circ}$  F." (p. 103). It should be noted, however, that in his comparative study of temperature and energy, Huntington seems to draw no distinction between the temperature of the outside air, to which his figures and curves refer, and that indoors, which is artificially controlled, and to which the workers were subjected at the time their efficiency was being tested.

So far as is at present clear, the daily changes in the weather conditions, and particularly in temperature, are quite as important as the mean conditions for any given day or period. The author furnishes an interesting series of curves (p. 114), which brings out the fact that human activity varies in accordance with the change in the mean temperature from one day to another. Thus it appears from the records of some 300 men in two Connecticut factories that their efficiency rises towards its maximum when there is a fall in the temperature on successive days of from eight to ten degrees ; thereafter the curve of efficiency dips ; on the other hand, an increase in the temperature produces a similar effect, although not quite to the same extent. The same relation holds good for mental activity, but with rather important differences. The significant point is that uniformity of temperature, at whatever level, does not conduce to maximum efficiency ; in other words, "a variable climate is highly desirable if people are to be efficient."

Now two factors determine the number and intensity of these daily temperature changes, which seem so necessary for human activity, namely, the seasonal change of temperature, since more or less corresponding to it there is a daily variation, and the number of cyclonic storms. From this point of view Huntington has a most suggestive chapter on the ideal climate, that being defined as those average atmospheric conditions which are best for man's work. From a study of the distribution of these principal factors—the mean temperature of the seasons and the degree of storminess induced by the passage of cyclonic conditions—it becomes possible to form an estimate of the relative stimulating power of the different climates of the world, and hence to arrive at an approximate idea of the possible distribution of human energy throughout the globe. It affords a certain amount of satisfaction to discover that England, with which the author would no doubt also associate Scotland south of the Caledonian Canal, "apparently comes nearer to the ideal than almost any other place. The climate is stimu-

lating at all times, both by reason of abundant storms and because of a moderate seasonal change." California is also among the regions where the climate approaches the ideal, but there the conditions are too uniformly stimulating, and Huntington has some suggestive remarks to make upon the possible relation of this fact to the prevalence of insanity and suicide in that State.

On the basis of his conclusions as to the necessary elements in climate from the point of view of maximum human efficiency, Huntington has compiled a map to show the distribution of energy throughout the globe; not, however, the energy of the present inhabitants of each region, but that which might be expected of Europeans if they settled in these areas and were influenced in the same way as are the people of the eastern United States, whose degree of energy and activity forms the basis of Huntington's arguments. Unfortunately, for the purpose of such a map, all the requisite data are not available; there are no satisfactory records of humidity or of daily temperature changes from which a world map of any accuracy could be constructed, and consequently the author has been obliged to omit the consideration of humidity altogether, and to make use of approximations in the case of some other factors. He makes no greater claim for his map than that it is a first approach to the truth, and as such it succeeds in bringing out several extremely interesting and rather surprising points. Perhaps the most significant relates to the position of Siberia, which occupies a comparatively low place among the regions of energy, and, if this can be ultimately established as correct, it must considerably modify the possible development and prospects of Russia's eastern domains as a centre of European civilisation. The position accorded to Siberia on the energy map seems to be in accordance with Nansen's view of the Siberians as lacking in care, forethought and energy in cultivating and fertilising the soil, and also with that of Rodishev, who regards them as "a people without enterprise or initiative." Thus, concludes Huntington, "Russian autocracy has accomplished its purpose more fully than it realises. It has not only exiled many of its most thoughtful and active people, but has sent them to a place where not only do the isolation and hardships diminish their power, but where nature insidiously accomplishes exactly the kind of repression that the authorities desire," for although many of the exiles have gone east with the intention of pursuing their intellectual activities and their scientific work, their purpose is seldom achieved. "They say that at first they begin to work with great vigour, but after a year or two their energy declines. They have the desire to work, but do not seem able to do so" (p. 147).

So far Huntington's arguments and conclusions are of the highest possible interest, and he has been able to bring together much useful material in support of his main contention. Enough has been said to suggest the originality and value of the work, for obviously many of his conclusions are of great significance from the point of view of practical life. If, for example, mental energy is so intimately bound up with the climatic conditions, then the intellectual worker stands to gain from a careful consideration of these conditions. In the same way

Huntington's conclusions have a valuable lesson for the more scientific management of industry. Thus the manufacturer, "who contemplates establishing a factory, will be able to determine the precise efficiency of labour in the different places which he has in mind, and can put the matter into dollars and cents for comparison with the cost of transportation, raw materials, and other factors." Moreover, if the industrial output could be regulated in accordance with a well-established seasonal curve of energy, there would be a total economic gain to the country concerned, while "the operatives would scarcely be conscious of the difference, and they would probably do more work and preserve their health better than under the present system." Huntington makes the rather extravagant suggestion that the day may come when there will be a seasonal migration of communities on a very large scale from one climatic zone to another, in order to obtain the benefit of the optimum conditions at every period of the year. "The expense of such a system of having two homes for a large part of the population will doubtless be enormous, but that is relatively unimportant." Perhaps so, but there are other difficulties. Without indulging in such extravagant fancies, it seems clear that the application of some of Huntington's conclusions may in time effect very considerable changes in the distribution and mode of life of the world's population, from the industrial, the economic, and the social point of view.

Having developed this extremely suggestive argument upon the relation between climate and human energy, Huntington proceeds to a much wider question, and one which, owing to the lack of data, calls for entirely different and much less reliable methods of investigation. So far he has been able to apply a quantitative test to his conclusions, and then only within narrow limits; but in passing to examine the distribution of the higher elements of civilisation he essays a much more difficult problem, to which the quantitative test cannot be applied. His purpose is to prepare a map to show the distribution of those characteristics which are generally recognised as of the highest value; that is, of such qualities as "the power of initiative, the capacity for formulating new ideas and for carrying them into effect, the power of self-control, high standards of honesty and morality, the power to lead and control other races, the capacity for disseminating ideas. . . . These qualities find expression in high ideals—respect for law, inventiveness, ability to develop philosophical systems, stability and honesty of government, a highly developed system of education, the capacity to dominate the less civilised parts of the world, and the ability to carry out far-reaching enterprises covering long periods of time and great areas of the earth's surface."

Now it is obvious that for most of these qualities no quantitative standard exists; in some cases statistics may afford a means of measurement for the material things, but "the higher elements of civilisation" are not material, nor can they be measured by material standards. Huntington is, of course, quite alive to the difficulty, but by no means daunted by it, and he has made an exceedingly ingenious and interesting attempt to ascertain the distribution of civilisation throughout the

globe. For this purpose he obtained from over fifty representative men of wide knowledge throughout the world—geographers, anthropologists, publicists, and scientists—their opinions as to the position in the scale of civilisation of the different political units of the world. In passing it may be remarked that British opinion was represented by Mr. George Black of Sydney, whose were the only views forthcoming from any part of the empire outside our own islands, Lord Bryce, Sir Leonard Darwin, Sir T. H. Holdich, Sir H. H. Johnston, Dr. J. S. Keltie, Mr. T. S. Longstaff, and Mr. Douglas Carruthers.

On the basis of the votes of those who responded to his appeal for their views, Huntington has compiled a map of the world distribution of civilisation, one aim of which is to endeavour to supply a need that exists in all our geographical, historical, sociological, and economic discussions for “a stronger emphasis upon human character, that is, upon the mental and moral qualities which dominate the civilisation of the various nations.”

A moment's consideration will suggest what scientific value can be placed upon a map, the basis of which is simply a consensus of expert opinion, however representative and carefully selected. Even if the world did contain as many as half a dozen individuals competent to express a judgment upon the status in civilisation of every part of the globe, such individual opinions would still remain entirely subjective, arbitrary, and inevitably biased by personal considerations of race, history, and environment. Huntington obtained his material prior to August 1914, but if the task had to be undertaken again it is just possible, in the light of what has happened in the interval, that Germany would not occupy the exalted position in the scale of civilisation which these experts formerly accorded to that country. It would have added to the entertainment of the book, and also perhaps to the discomfiture of the experts, if Huntington had been at liberty to make public the detailed opinions which he obtained from each contributor. He has, however, been able to publish the views of a shrewd observer, the Swiss anthropologist, H. Ten Kate, and the opinions of this neutral upon the relative positions in civilisation of our own country and Germany have more than usual interest at the present time. It should be explained that the contributors were required to assign each country to one of ten classes, No. 10 being the highest in the scale, so that this class number may be regarded as the “index of civilisation” for the country in question. For power of initiative Ten Kate assigns our own country to the highest group, while Germany is placed in group 8; in ability to carry out far-reaching enterprises Great Britain finds a place in group 10, while Germany is allocated to group 6. But he considers Germany superior to ourselves in inventiveness and the capacity for formulating new ideas, in the ability to develop philosophical systems, and in the sense for beauty both in art and literature. Under the head of the standard of honesty and morality our own country is placed in class 7 and Germany in class 6, the Netherlands being the only country in a higher category than our own. In the power to lead and control other races our country is assigned to



class 9, while Germany occupies a humble place in the second lowest group.

In spite of the shortcomings and limitations, which Huntington candidly recognises, of this ingenious attempt to arrange the countries of the world according to their status in civilisation, or what a sedate President of a certain Geographical Society describes as "the most humiliating game I have ever tried," it is by no means devoid of interest and value, although its actual scientific worth, because of the absence of definite standards of comparison, appears to be of the slightest. With this rather unpromising and certainly wholly inadequate material Huntington has endeavoured to construct a map. The primary object is to afford a means of comparison of the distribution of energy and of civilisation, and ultimately of climate, and certainly some of the results are exceedingly striking and suggestive, showing in most cases a remarkable degree of harmony between the different phenomena. This method of indicating the distribution of the elements of civilisation may perhaps be more safely and successfully applied to a small area within which the necessary data are more ascertainable, and for that reason more value may be attached to Huntington's series of maps for the United States. The close agreement which these maps reveal between the climatic conditions, the energy and the civilisation of the country, certainly strongly supports the author's main thesis as to the intimate relation between these various factors, and his inquiry has resulted in an exceedingly stimulating and brilliant contribution to a complex and difficult problem.

Huntington endeavours to complete his investigation by applying the results he has reached as to modern conditions to the civilisations of antiquity. Whoever undertakes the task of reconstructing the pre-historic conditions, whether of the physical features of the earth or of its inhabitants, must too often abandon the realms of fact to enter the fields of pure speculation, and these are inclined to be rather trackless. With a less safe guide than Huntington the wanderer is seldom likely to return. Yet the fact remains that in regions which to-day are barren and backward, where the climatic conditions almost prohibit human settlement, we find memorials of an ancient civilisation that evidently reached a remarkable level, in the tombs of Palmyra, the temples and irrigation works of Mesopotamia, in the buried cities of Central Asia, and, perhaps above all, in the wonderful Maya ruins of Central America. Obviously, unless we are to assume that the members of these past civilisations possessed very remarkable powers, such as belong to no modern people, whereby they were able to make many blades of grass grow where none can be grown to-day, there is a very strong argument in favour of climatic change within historic times. If such a change can be demonstrated and some light be thrown upon the contemporary climatic conditions of these ancient civilisations, it will make much easier the interpretation of the history of these peoples, but it will still leave much unexplained. Thus, if it can be proved, for example, that when the Mayan civilisation was evolved the climate of Central America was completely favourable for human activity, it would certainly elimi-

nate the factors of food-supply and health from the Mayan problem, but it would offer no solution of the mystery of the remarkable accomplishments of a people devoid of metal tools and of beasts of burden.

The course and explanation of such a climatic change has long been a matter of acute controversy. Many of the theories formerly held to account for the process of desiccation, such as deforestation, seem no longer tenable. Huntington's conclusion is that a movement of the climatic belts has taken place, the effect of which has been temporarily to shift the zone of cyclonic storms towards the equator, thus bringing within the region of storminess areas which to-day are either arid or semi-arid. This migration appears to have been a world-wide phenomenon, neither regular in time nor uniform, but subject to pulsations which seem to have reached their greatest intensity in the earlier eras of history. It may be noted that this pulsatory hypothesis has been adopted by Penck (*Scot. Geog. Mag.*, vol. xxx. p. 281), quite independently of Huntington's investigation and from an entirely different standpoint Huntington finds evidence for the theory in an elaborate series of measurements which he carried through on a large number of Californian trees, some of which were over three thousand years old. The variation in the size of the annual rings furnishes a fairly exact indication of the fluctuation of the rainfall throughout the period, and the evidence thus afforded agrees in the main with the theories which the author had already formed with reference to the conditions in Palestine, and suggests that the pulsatory movement was a widely distributed phenomenon. Further, he has been able to adduce an interesting piece of fresh evidence in support of his views, based on researches upon the sodium and chlorine deposits and the past levels of several brackish lakes in the Western States. From his examination of the data, some of which, however, appear to be highly conjectural and scarcely adequate enough to be convincing, he concludes "that about two thousand years ago the dry, western parts of the United States were still under the influence of a pronounced moist period" (p. 235). Moreover the series of strands on the exposed margins of the lake seems to point to a very irregular rise and fall in the level of former times.

In explanation of the pulsation of climate in the past Huntington suggests the influence of solar activity during cyclical periods of maximum sunspots. Following Köppen, Newcomb, and Kullmer, the argument seems to be that the increased amount of heat, which the sun radiates during periods of maximum spottedness, gives rise to a wider and more frequent distribution of cyclonic storms, resulting in strong convectional action, which probably explains the fact that at such periods the earth's surface becomes cooler than the normal. Two very instructive maps show the comparative storminess throughout the United States and the distribution of the rainfall in Europe during the times of maximum and minimum sunspots, and the conditions which these maps reveal seem quite in accordance with the theory of Penck and Huntington as to the shifting of the climate belts. But the diagrams on page 248 of the number of sunspots since their occurrence was first recorded in 1749 does not appear to justify the statement that "they

show unmistakably that the sun's spottedness varies in cycles having a length of a century more or less," unless an extremely wide latitude is to be allowed; the curves suggest something much nearer a fifty-year period. Obviously much more information is required not only about the frequency of sunspots but also about their intensity, and, unfortunately, that is unattainable except for the last century and a half; but even with the available data it is still impossible to postulate very much until further investigation is made into the relation between these sunspots and the frequency and degree of storminess and the general climatic conditions. Meanwhile, however, the sunspot theory supplies a useful working hypothesis for Huntington's thesis.

In all investigations of such a kind as Huntington so brilliantly attempts, there is a very real danger lest they should be undertaken by individuals who do not possess the necessary equipment and scientific training. Already the interests of geography have suffered more than enough and grievously at the hands of a certain school of geographical teaching on account of a reprehensible tendency to pass into popular currency certain phrases and ill-defined ideas and generalisations, based upon wholly inadequate data. A ready example may be found in many current geomorphological speculations which the unwary reader is too apt to accept as established facts. Sometimes the danger springs from the fact that the necessary materials for the particular conclusions are not available, but more often perhaps because the authors of such generalisations do not possess the requisite scientific temperament to sift all the evidence, and are usually more attached to their theories than to the facts. Nevertheless such considerations must not be allowed to prevent legitimate scientific inquiry, honestly pursued. And that is what Huntington has attempted. Not only does he give an extremely lucid exposition of his own theories but he does his utmost to anticipate and to counter the objections likely to be raised against them. Even if his arguments are not always convincing or conclusive (we wish, for example, he had carried his theory as to the stimulating effect of the climate upon the successive conquerors of Mesopotamia a stage further and offered some explanation why the same results are not in evidence among the late occupants of Baghdad), yet they always deserve the most careful consideration. As the author points out, it is possible "to discuss scores of ways in which a knowledge of the exact effect of climate may assist in the understanding of historic events, or help in guiding future developments. Such discussions are bound to be inconclusive until the world comes to a more definite agreement as to the exact effects which climate exerts upon human beings," both from the physiological and the psychological point of view. It is because Huntington has initiated an inquiry, which in time may be productive of many far-reaching scientific results, that his book demands the most thoughtful attention not only of geographers but of all students of human progress.